

SCIENCE

FRIDAY, OCTOBER 28, 1887.

AT NÄÄS, SWEDEN, the third summer course of normal training in slöjd, which is the equivalent of our manual training, began towards the end of July with a total attendance of eighty. Of these, twelve were English and eighteen were Italians, sent by their government to receive the training. New and commodious buildings had been erected during the past year, and the school was favored with many distinguished visitors during the summer. Encouraged by the reception of her article in the London *Journal of Education* on slöjd, Miss Evelyn Chapman announces a slöjd training-course for teachers, to be held at Birmingham during the holidays. Miss Chapman has an efficient colleague in Miss Nyström of Stockholm, who was the first directress at the Nääs seminary. It is hoped that the efforts of these two ladies will result in introducing manual training in the board schools of Great Britain. In this country the progress of manual training has been very rapid of late, and we hear almost daily that some new locality is considering the subject. Paterson, N.J., is about to take favorable action in this matter, and Hoboken and other cities of the same State are expected to follow Paterson's example.

THE *New York Times*, a paper which has in earlier days, in the contributions of Holley and Newton and their successors, supplied much more valuable and interesting scientific matter to its readers than the average daily newspaper seems to feel called upon to give the intelligent portion of its patrons, and which has dealt less in the coarse and vulgar accounts of crime and folly which make up the average staple than many of its contemporaries, recently, under the heading, 'Is Heavy Artillery doomed?' presents an account of an invention, destined, apparently, to overthrow all existing methods of ordnance construction and operation. Since the *Times* has allowed its 'funny man' entrance into its editorial columns, its readers have sometimes been at loss to know whether some of its articles are genuine 'information,' are the product of an overworked vender of the 'humorous,' or are simply the gossip of an ignorant penny-a-liner. The several characters are sometimes found to operate in so circumscribed a field, that it is difficult to say whether the article of the day is to be assigned to one or to another of these usually far-removed classes. Possibly it may be the intention, as apparently in the article here referred to, to kill two birds with one stone, amusing the smaller and more intelligent class of readers, while gulling most mercilessly the larger and less well informed body of its patrons, who may not have had the advantages of a good common-school education. It certainly cannot be presumed that its editors are of the latter class. The general make-up and character of the *Times*, and the fact that its proof-reading and orthography are very correct, would forbid that supposition being held a moment. The story which it is so difficult to classify, and of which it is so utterly impossible to guess the origin, is that a distinguished Russian chemist has discovered a new explosive, of extraordinary power, and endowed with a capacity for evading or directly overcoming the second of Newton's laws. This new compound furnishes an exception to the general rule, and here action and re-action are *not* "equal and opposite in direction." In fact, the re-action is turned directly about, apparently, and effectively assists direct action in its destructive mission. This wonderful explosive acts in but one direction, and that is the direction which is suggested to it by its manipulators. A tube of cardboard, of tissue-

paper, — or, we may presume, the geometrician's imaginary cylinder, — serves to communicate the intent of the 'captain of the gun,' and the stored energy of the combustible starts off in the indicated direction, impelling the projectile with inconceivable force, and with not even sufficient recoil or lateral expenditure of force to crumple the imponderable gun. The latter, it may be presumed, is, when out of action, packed down like an opera-hat into the least possible space, and put in the pocket of the officer in command, or stored in the caisson until again required for the demolition of an iron-clad or the destruction of a fortress. The only really puzzling fact is, however, that the inventor of this extraordinary explosive, in the quiet seclusion of the *Times* office, — for the Russian must have become domiciled there, — does not seem to have successfully applied the tremendous brain-power, which has thus defied the laws of nature, to the completion of his work by also inventing a projectile of lightness commensurate with that of his gun, and to have endowed his explosive with a 'negative gravity' such as readers of his article must experience and appreciate. He would thus have realized the idea of Lord Lytton, and would have won immortal fame by presenting to the world the blessed 'VRILL,' which we now know only in the fictions of that great novelist. We would suggest to our neighbor of the *Times* that he secure a good supply of that marvellous 'sleetover,' and turn it, first upon his 'funny man,' and then upon those unsympathetic neighbors among the 'great New York dailies' who are prone to smile at such *facetiae*.

AT THE RECENT meeting in New York, of the American Association for the Advancement of Science, the fact that the remains of the great naturalist Audubon lie in an obscure and little-visited portion of Trinity Cemetery, New York City, and that his tomb is unmarked by any distinguishing monument, was brought to the attention of the members. The demands upon the time of all in attendance at that meeting were so great, that no action was taken by the association, although the most lively interest was expressed by individual members, and the propriety of marking the resting-place of the founder of American ornithology by a suitable monument was appreciated. The Audubon plot in Trinity Cemetery will probably be disturbed by the continuation westward of 153d Street. The trustees of the cemetery have with commendable liberality assigned the Audubon family a new lot close to 155th Street, in full sight of Audubon Park, and near the end of Audubon Avenue, when this shall be continued from the north, and are in hearty co-operation with the monument enterprise. At the first autumn meeting of the New York Academy of Sciences, a committee was appointed to solicit funds and make all arrangements for a monument. Vice-President Trowbridge then appointed as such a committee, Prof. Thomas Egleston of the School of Mines, chairman, Prof. Daniel S. Martin of Rutgers Female College, and Dr. N. L. Britton of Columbia College. This committee has organized with Dr. Britton as secretary and treasurer, and is now ready to receive subscriptions, which will be properly acknowledged. Checks should be made payable to N. L. Britton, treasurer, and post-office orders should be drawn on Station H, New York City. The committee estimates that between six and ten thousand dollars will be required to erect and engrave a shaft worthy the memory of America's first naturalist, and, while confident that this amount will be forthcoming, desires to have interest taken in the project by scientists in all departments, in all portions of the country.

ASPECTS OF EDUCATION.

Naturalism.

THE two aspects of education which we discussed in *Science*, ix. Nos. 211, 215, 227, have reference to the different ways of training the intellect. They are, however, both liable to degenerate into pedantry. With regard to the study of language, this statement needs little proof. It is difficult, under any circumstances, to reconcile an education which is merely linguistic with the preparation of the active business of life. Perhaps the best example of such a training was the rhetoric of the Romans. Quintilian's famous treatise on education described the training of the orator, and it requires some reflection to discover how so narrow and restricted a course can be co-extensive with all that is demanded by the public service. It might, however, be so in imperial Rome. The business of Rome was to govern subject populations. A Roman statesman would have occasion for oratory in the senate, at the bar, in the governing of the province. Given the traditional inspiration which would be imbibed from a race of rulers, and the practice of public affairs, with which every Roman patrician would be familiar from his childhood, the training of the orator in its widest acceptance might be the only addition which was considered necessary. Humanism, however, lay but little stress on the public use of knowledge which it gave. It taught dead, not living languages. The greatest scholar might live secluded from the world, and, as his erudition deepened, might become less fit either to influence or to understand it.

Realism was by its nature more closely connected with actual life; but that, too, might content itself with books, and the study of books produces book-worms. The rebellion against received opinions which followed the Reformation brought every thing into question, and the groundwork of education with the rest. As feudalism disappeared, there was more need of such an inquiry. In the middle ages the education of the castle had existed side by side with the education of the cloister. The knightly arts of shooting, hawking, swimming, riding, and other bodily accomplishments, were taught to the young page, as the seven studies of the trivium and quadrivium were taught to the young monk. As years went on, the idle governing classes were gradually subdued by aggressive instruction. The schools of the Jesuits were eminently fashionable, and it became necessary to appeal once more to nature. Men of the world and philosophers said, in giving what we call a training to the mind, "Let us not forget that nature has determined the quality, and a large part of the development, of the mind which we aspire to train. If we do our utmost, we can effect but little: let us be quite sure, that, in attempting to produce this small amount of good, we do not cause real harm. Let us educate, not for the school, but for life. Let us see what inherent force will effect for the mind and character of which we think ourselves master." There is some trace of this reasoning in Rabelais; but, although he is certainly an anti-humanist, he should be classed as a realist rather than as a naturalist. The three great naturalists in education are Montaigne, Locke, and Rousseau. Although their characters were very different, there is a strong similarity in their teaching. We will give a short account of the views of each. This is the more necessary, as naturalism is now rampant in our public schools, but its advocates and supporters have little notion to what philosophers they owe the principles which they enthusiastically support.

The contrast between monkish erudition and the training for the world given in the castle of a wise noble is shown by Rabelais in the contrast between the clownish awkwardness of young Gargantua, and the modest self-possession of the page Eudæmon, who, "although not twelve years old, first asking leave of his master so to do, with his cap in his hand, a clear open countenance, beautiful and ruddy lips, his eyes steady and his looks fixed on Gargantua, standing up straight, on his feet, began to commend him with proper gesture, distinct pronunciation, and a pleasing delivery, in choice Latin," whereas all Gargantua did was to cry like a cow, and hide his face with his cap. Rabelais also lays great stress on bodily exercises, and shows that he considers the training of the body quite as important as that of the mind.

The educational ideas of Montaigne are principally contained in

two essays, — one on pedantry, the other on the instruction of children. The one deals with the objects of education, the other with its methods. Montaigne says that the end of education is not to fill the head with a mass of knowledge, but to form the understanding and the heart; not to burden the memory of the pupil, but to make him better and more intelligent. Antiquity presents us with well-educated statesmen and commanders, with philosophers fit for practical life. On the other hand, learning, which is only for show, is of no use to its possessor. If we only knew what Cicero or Plato thought about a matter, we are merely the guardians of some one else's property instead of making it a possession of our own. We warm ourselves at our neighbor's fire instead of making one on our own hearth. We fill ourselves with food which we cannot digest. The most important object of education is independence. The scholar must be able to consider and to employ what he has learned in a hundred different ways. He must be taught to prove every opinion, submit to no authority as such. Learning by heart is no learning at all. Just as we cannot dance, ride, or fence without moving the body, so we cannot speak or judge with advantage without acting for ourselves. The mind must be supported by a healthy body. There must be no coddling or spoiling by foolish parents: the boy must be hardened to endurance and to pain. We are educating, not a mind and a body, but a man, who is compounded of the two. The pupil must be taught to mix with the world, to observe carefully every thing he sees. He must learn more from experience than from books. The character of great men is more important for him to know than the dates of their actions. The greater number of sciences which we are taught are of no use. The pupil must not become a book-worm, but all the conditions of his life — his walks, his meals, solitude, and society — must be made serviceable for his training. He must be taught to speak naturally, with strength and emphasis; not by erudition, but by force of character and clearness of thought. For discipline we must use a kind severity, not punishment and compulsion. The school-life must be full of joy and cheerfulness. The most important thing is to excite a desire for study. Fathers should stimulate their children by their own example, and not keep them morosely at a distance. Montaigne says that he was first taught Latin by conversation, and he recommends the same course for imitation. He tells us that when seven years old he was entirely ignorant of French, but he was well acquainted with pure Latinity, and that without books and without tears. From this sketch we find that Montaigne's object was to educate the man of the world. He wished to bridge over the gulf between the gentleman and the scholar, which existed in his time; but he would produce a gentleman at any price, a scholar if possible.

We cannot tell whether Montaigne had a direct influence upon Locke, but there is no doubt that they agreed very materially in their views. The keynote of Locke's thoughts concerning education is a sound mind in a sound body. This, he says, is a short but full description of a happy state in this world. He that has these two has little more to wish for, and he that wants either of them will be but little the better for any thing else. The first thirty sections of his treatise are occupied with the training of the body. His maxims are summed up in the words, "plenty of open air, exercise, and sleep; plain diet, no wine or strong drink, and very little or no physic; not too warm and strait clothing; especially the head and feet kept cold, and the feet often used to cold water and exposed to wet." The next hundred sections are devoted to methods of education, but there is nothing in them about books. Virtue, wisdom, and breeding are to come before learning. These are to be taught more by precept than by example. We are to guard our children against the evil influence of servants, and to rely particularly on the persistent effect of the home. Above all, we are to teach knowledge of the world. Much of the danger which surrounds young men arises from ignorance of the world. A man forewarned is fore-armed. Breeding must come before book-learning. Teaching is for the purposes of life, and not for the school: *Non scholæ sed vitæ discimus*. The tutor you choose for your son should be a man of the world. Locke puts learning last, because he considers it as the least important learning. He says it must be had in the second place, as subservient only to greater qualities. Seek out somebody that may know how

discreetly to frame his manners; place him in his hands, where you may as much as possible secure his innocence; cherish and nurse up the good, and, generally, correct and weed out any bad inclinations, and settle in him good habits. This is the main point, and, this being provided for, learning may be had into the bargain, and that, as I think, at a very easy rate.

The subjects which Locke selects for learning are very characteristic. He begins with reading, writing, and drawing. He then goes on to French and Latin; the latter to be taught in the same way as French, by conversation and without grammar. He then passes to geography, arithmetic, astronomy, geometry, chronology, and history. Then follows ethics, a certain amount of law, — chiefly civil and constitutional law, — rhetoric and logic, and natural philosophy. Great importance is attached to acquiring a good English style. Greek is omitted; for Locke says that he is not considering the education of a professed scholar, but of a gentleman, to whom Latin and French, as the world now goes, is by every one acknowledged necessary. "When he comes to be a man, he can learn Greek for himself. What a small percentage there is, even among scholars, who retain the Greek they learned at school!" The education thus commenced is completed by dancing, music, riding, and fencing. Every one should learn one trade at least, if not two or three. Gardening and carpentering are especially recommended, but not painting. The pupil is to be well skilled in accounts and book-keeping, and his education is to be completed by foreign travel, which is to be deferred to an age when he can profit by it most completely.

Locke is a great enemy of those specious and spurious studies which were so much affected by the Jesuits. He is a declared enemy to Latin verses. "Do not," he says, "let your child make verses of any sort; for, if he has no genius for poetry, it is the most unreasonable thing in the world to torment a child, and waste his time, about that which can never succeed; and, if he has a poetical vein, it is to me the strangest thing in the world that a father should desire or suffer it to be improved. Poetry and gaming, which usually go together, are alike in this too, — that they seldom bring any advantage but to those who have nothing else to live upon. He does not care any more for music, which wastes so much of a young man's time to gain but a moderate skill in it, and engages often in such odd company that many think it better spared." Locke here would differ much from Milton, who gave music a more dignified place in his programme. In conclusion, Locke tells us that what he has written is designed for the breeding of a young gentleman, but that he is fully aware that every one cannot be educated in the same manner; that each man's mind has some peculiarity, as well as his face, which distinguishes him from all others; and that there are possibly scarcely two children who can be brought up by exactly the same method.

Although public schools in England educate their pupils very much according to the precepts of Locke, they probably do so unconsciously, and are very little aware whose example they are following. Many have heard of Locke's treatise on education, but few have read it or tried to understand it. Whatever effect he has had has been confined to his own country, and he cannot be reckoned as a great influence in Europe. Rousseau, on the other hand, burst upon the world with tremendous force. 'Emile,' although its teaching about education is so little precise and systematic, has made an epoch in educational systems, and is the parent of Pestalozzi, Froebel, and the most modern educators of the present day. The keynote of Rousseau's system is to educate in accordance with nature: he may therefore be regarded as the chief of the naturalists. It is true that his conception of nature was warped by the principles of his philosophy. He considered that man in his natural state, as he came from the hands of his Maker, was perfect, and that he has been spoilt by civilization. This idea was present to the mind of Rousseau in his very earliest writings. By what means, he asks, are we to bring back the child of nature? How are we to form that strange character, natural man? Our particular care must be to provide that he is not prevented from being natural; we must not educate him for any particular function, but merely for the art of living. A man must be taught, above every thing, to lead the life of a man, and that must be done not so much by precept as by exercise. In the time of Rousseau children of the

upper classes were brought up entirely in an artificial atmosphere. This, he says, we must do away with: great social changes may be before us, and we must prepare our children to meet them. The reformation must date from the very birth: mothers must take to nursing their own children. He says, speaking of the unnatural society of his own time, "Once let women become mothers again, and men will then become fathers and husbands." As the child grows, the advice of Milton corresponds with that of Locke. He is to be brought up in the fresh air of the country, set free from bands and swaddling-clothes, taught to endure pain and hardship and change of temperature, he is to be fed on very simple food. The father has duties as well as the mother. As soon as the child is old enough to be influenced by the father's education, it is wicked of him to hand him over to another. Rousseau passes the strongest condemnation on fathers who neglect their children, whereas he sets them the worst example by depositing all his children, as they were born, in the turning-box of the foundling-hospital. Unfortunately many fathers are so occupied that they cannot give their children the minute attention which is necessary for their education, so that there is no remedy but to find a tutor who will as nearly as possible supply the place of the father. The tie between tutor and pupil is to be of the closest character. The second book of 'Emile' is concerned with the education of a child up to twelve years of age. The principal object of this education is courage. The child must learn to bear suffering, and to put up with tumbles and knocks, without uttering a cry. Strength, health, and a good conscience are the objects to be aimed at. Do not reason too much with children at this age: they must be made obedient by authority, and reason will come later. The great object of this early education is to lose time. The child is not old enough for good impressions to be firmly fixed: we must be content with averting bad ones. A child is to learn the elements of property, that some things do and some do not belong to him; but of erudition he is to learn very little. At twelve years, Emile is scarcely to know what a book is. You have educated his character by strengthening his body: if he has the vigor of a man, he will soon have the reason of a man. During this age the process of hardening is to go on: he is to wear loose clothing, to go with his head uncovered, to lie on the damp grass when hot with exercise, sleep all night, to rise with the dawn, to know nothing but a hard bed, to fear no danger, to be accustomed to toil, unpleasantness, and pain, and to defend the soul with the breastplate of a strong body. Thus armed, he will not even be afraid of death. He is to be as much at home in the water as on dry land. He is to acquire arts which are found in the natural savage, the instinct of finding his way in dark places, of measuring distances with eyes and feet, and of beating all those of his age by swiftness of foot. He is to learn the piano rather than the violin. He is to draw from nature, to learn geometry rather by observation than by definition, to learn singing by the ear rather than by the notes. His appetite is to be the measure of his food. The sense of smell is to be educated with all his other senses. At twelve years old, he ceases to be a child: we are now to prepare him for manhood. We find that he is fresh, lively, open, and simple; his thoughts are limited but clear; he knows nothing by heart, but much by experience; he has read more in the book of nature than in any other book; his wit is not on his tongue, but in his head; his judgment is better than his memory; he only speaks one language, but that sensibly. Others may speak better: Emile will act better. He does not follow formulas and authorities, but in every thing which he says and does he is inspired by his own good sense. There is nothing artificial in his manner and bearing, but they are the true expression of his ideas, and the result of his disposition. In this language, and much of the same kind, Rousseau sketches the child of nature. One would think again, that, like Locke, he is depicting the English public-school boy; but he could not have known any such, and the country gentleman who favors such institutions would rather follow any counsel than that of a dreamy revolutionist.

The intellectual education which Emile receives between the ages of twelve and fifteen is not less remarkable than his social training. Nothing is learned from books, every thing from observation. The pupil is not asked to understand what he has taught, but to discover things for himself: for instance, as he takes his morning and even-

ing walk, he is led to observe the course of the sun, how it rises and sets in different places according to the time of the year. In this manner he is led to ask questions about the course of the heavenly bodies, the form of the earth, and the calculation of eclipses. For the study of geography, no maps are placed before him. Starting from his home, he is led to make maps for himself. In this manner the natural desire of the child for knowledge is taken as the starting-place for learning, which in itself is never allowed to be a burden or trouble. Just as growing plants require not only light, but heat, so the growing man needs not only instruction, but amusement. Emile finds out by himself the existence of the meridian line and the peculiarity of the magnetic needle. He observes that by rubbing amber, glass, or sealing-wax, he is able to attract pieces of straw. In this way he learns the properties of positive and negative electricity, and connects them with the magnet. Going to the fair, he finds a conjurer who draws a waxen duck in different directions over a basin of water by presenting to it a piece of bread: he soon guesses that the bread contains a magnet, and is able to imitate the trick to the astonishment of the conjurer. The conjurer takes his revenge by placing a stronger magnet under the table, so that the duck resists all Emile's efforts. The revelation of this trick is an avenue to still further knowledge. We see here that education is made not to depend on words, but on things. No formal instruction is given. Certain things are observed to take place, and the instruction lies in the conclusions which are to be drawn from them. In a similar way great importance is attached to what would now be called technical education. Emile is to have no books except 'Robinson Crusoe,' from whose example he is to learn how to supply all his needs. Instead of reading, he is to visit workshops and practise handicrafts: he will learn more in an hour's work than he would in a whole day's explanation. Even trades are to be estimated by their usefulness. The blacksmith is placed higher than the goldsmith: the baker is worth the whole academy of sciences. Emile must learn a trade. What trade is best for him? Agriculture is exposed to too many casual losses. Many trades are merely the handmaids of luxury, and produce nothing worth having: others are unwholesome either from confinement or from the attitude in which they are practised. There are objections to the more violent trades, such as masons and smiths. The best of all is to be a cabinet-maker, which is useful, cleanly, and instructive. The modern development of technical education seems to have followed on Rousseau's lines, and to have placed working in wood in the first rank.

Thus, when his boy's years come to an end, he possesses, not a great number of opinions and accomplishments, but the capacity for acquiring them. Such learning as he has, is thoroughly natural. He does not know even the names of history, metaphysics, morals, but he is accustomed unconsciously to reason about all of them. He is industrious, moderate, patient, and courageous. He does not know what death is, but, if necessary, he would die without a sigh. He demands nothing from others, and is under no obligation to them, but stands alone and independent in human society. He has no errors but those which are avoidable, and no faults except those from which no man is free. He has a healthy body, active limbs, a mind free from prejudices, a heart without passion. He has been scarcely affected by self-love, the first and the most natural passion: he has lived contented and happy, and free, so far as his nature allows. Do you think, asks Rousseau, that a child who has thus reached his fifteen years can have lost the years which have preceded?

Rousseau's book produced a great effect throughout Europe. It is said that Kant, the philosopher of Königsberg, whose habits were more regular than the town-clock, suspended even his daily walk in order to read him, yet the practical teacher will learn but little from him. His principal effect lay in the strength by which he combated existing prejudices. When Rousseau wrote, education had become not only formal and artificial, but hollow and frivolous. The French revolution might have altered this by its unaided force, but 'Emile' still remains the book in which the ideas of the revolution about education were expressed with the greatest eloquence and vigor.

What shall we say about naturalism in the present day? It is largely practised unintentionally. While different studies are

struggling for the mastery, the natural desire for games and open-air activity occupies the field, and claims more and more of the pupil's life. In the vast development of modern industries requiring capacities of all kinds, some educationalists have seen an indication that special courses of teaching are unnecessary or useless. Nature, they say, and the pressure of the world's business, are the best teachers. How much skilled labor is demanded by a railway? Who trained the pointsman, the engine-driver? Who directed the complicated lines of trains, following and meeting each other with lightning rapidity, yet never colliding except by a terrible catastrophe? The teacher who follows the methods, either of humanism or realism, strives to make the best of the human mind intrusted to him. He wishes to develop its faculties to their highest point, to stimulate its natural capacity to its furthest limit. But when this is done, what guaranty have we that nature has any place for the instrument we have so carefully finished? If every mind were developed to the fullest extent which its powers admit of, yet a large proportion of such minds might remain useless and barren, because they fitted into no place which human society supplies. Leave every thing to Nature, she will fashion the material better than you can, into the form in which she most requires it. This statement is a paradox; and, indeed, natural education is in its essence paradoxical. It will always have advocates and apostles, especially in times when there appears to be a danger of over-refinement or over-pressure; but the wise educationalist will turn to it as a repository of cautions and warnings rather than as an armory of weapons fit for fighting against the ever-present enemies of ignorance and sloth.

OSCAR BROWNING.

THE ELECTRICAL ENGINEERING DEPARTMENT OF CORNELL.

THE equipment at Cornell in the line of electrical engineering bids fair to become, if it is not already, the most complete in the country, and probably in the world. It has been almost wholly contributed by friends of the university, at the suggestion of the director of Sibley College and others interested in its progress. The last and most important addition to the collection is that of the Westinghouse 650-light alternating current dynamo, exciter, lamps, and other material required in establishing the plant. The list of dynamos now includes the Edison, the Gramme, the Mather, the Westinghouse alternating current, the Westinghouse continuous, a number of Weston and minor makes, and all sizes, from a little toy machine made in the university shops, to the 50 or 60 horse-power machines just added to the list.

There comes with this liberality on the part of friends of the university an embarrassment of real importance: there is no immediately available room for the installation of these machines. The dynamo-room now appropriated to the purpose is hardly large enough for the 'cradle' used in conducting experiments on a single machine. The Weston machine is tucked in one corner, and the Edison and Mather machines are temporarily placed in the middle of the floor, and driven as best can be done from there. There is actually no room even to lay down the new machines now *en route* from Pittsburgh, still less to place them for use. In this emergency, the director has obtained permission from the trustees to make temporary provision for them by throwing the existing toilet-rooms into the machine-shop, thus securing a space of some fifteen or eighteen feet by nearly forty, in which to place all these machines. It has long been considered advisable, on the score of safety and convenience, to remove all heavy machinery from the main building, and this transfer of the dynamo-room will give opportunity to effect other improvements there in time. Professor Morris is already arranging new toilet-rooms, and getting ready to tear down the brick partitions which have been found to be in the way of the new arrangement. Professors Van Vleck and Smith are preparing plans for the belting and countershafting, in consultation with Professor Nichols, and the work is to be proceeded with at once. The space now given up to this machinery must, however, in time be required for the extension of the machine-shop, and it is only a question of time when a building must be constructed for this course and its collections. Nearly forty students now enter the course annually, and it is only second to the regular course in mechanical

engineering in importance in the Sibley College organization. The expenditure of all that may be needed to make its material part complete, aided as it is so effectively by its friends outside the university, will be more than justified.

Professor Thurston estimates that about \$100,000 should be expended in its permanent establishment: \$60,000 on building, including \$15,000 on water and steam power, each of which should give 150 horse-power, the one for use in ordinary work, the other whenever experimental work compels the utmost possible regularity of speed; and the balance, \$40,000, in supplying needed additions to the equipment of apparatus of exact measurement for heavy currents, and to furnish the income needed for running expenses, including fuel, one workman, and an assistant to the professor of physics, who should be placed in charge of this valuable property; which, although a part of the Sibley College establishment, is really managed by the department of physics in all except its power-supply. It is not impossible, that, as Mr. Cornell used to say, "there is some one walking around who wants to provide this" now greatly needed laboratory. It is certainly an opportunity for some wealthy and public-spirited friend of the university and of this side of its work to immortalize himself, while doing a noble work for his fellows.

THE STUDY OF MODERN EUROPEAN LITERATURE IN AMERICA.

THERE has been a marked change in the subjects of instruction and study in American colleges within the last few years. In literature, the study of French and German and early English has been substituted for Latin and Greek: physical science has won larger recognition, and political economy, history, and the science of government, have become prominent subjects of instruction. The change which has effected this result in the leading universities has been gradual, but many institutions are as yet untouched by its influence.

A comparison of the curriculum of any college now and that of fifty years ago would show that modern subjects now share the time formerly devoted exclusively to the classics, mathematics, and philosophy. The value of the old is not less, but new discoveries in science, and the recognition of the value of modern European literature, have displaced in part the former subjects of education. The pressing demands of modern life and modern culture have modified views, and the practical claim has been felt that the years of study should contribute to getting on in the world. These views have changed the direction of instruction, while the end of all education, intellectual discipline and the training of all the powers, has not been forgotten. What results have been attained, and what further changes are necessary that the new education may bear the choicest fruit?

The results of the study of the modern languages can be characterized as only in part successful. One American university still announces in its catalogue that the "modern languages are taught like the classical tongues." Until recently the instruction in French and German followed strictly the old method of teaching Latin and Greek. The fact that the language was still a living speech was ignored, and the pupil went forth as powerless in the presence of the language itself as a classical student would have been if he stood before an ancient Greek or Roman. Much time is undoubtedly still wasted by confused, illogical, and misdirected efforts on the part of teachers. The learning of a foreign tongue embodies the training of the eye to distinguish the printed words, the tongue to utter them, and the ear to recognize them when spoken. Linguistic training is not simple in the sense that one method will accomplish all these aims. There is beyond this the higher discipline of the study of language as the expression of thought, and its critical and philological study. The student who learns a living language as he learns a dead language will know no more of the one than of the other. Experience verified in the lives of all scholars shows how an ability to read a given language carries with it no practical mastery of the language: the ability to speak or write the language, and to understand it when spoken, is apart from a mere reading ability. Even the familiar sentences of the New Testament will not call up their Greek or Latin or German equivalent without special study. Instruction hitherto in modern

languages has been directed to impart a knowledge of the literature. The key to the literature has been found in the grammar and the lexicon. After a mastery of grammatical forms, reading has been begun.

The defects of this method are the same that have characterized all classical study,—the laborious acquisition of words, the perplexing idioms, the search after the true translation, now successful and now futile, a correct knowledge of which is only possible to one familiar with the genius and spirit of the language, and its idiomatic, provincial, or possibly archaic use.

The subtle flavor of a foreign expression cannot be distilled by the aid of the dictionary alone: it must come from a knowledge of the distinctive meaning and uses of words, and an intelligent apprehension of delicate shades of expression.

Only an exhaustive knowledge of literature and of the multiform usages of popular speech can give an inner insight into the spirit of a foreign language. Such knowledge is impossible to ordinary scholars; and even advanced study, unless covering the works of different authors and periods, cannot guide the student at a distance to a critical acquaintance with the language. The method is in itself inadequate, and the results unsatisfactory. Mental discipline of a high order may be associated with this method of study; and a language is often valuable as an instrument of culture from the fact that it transplants the scholar into a new world of thought, presenting sharp features of contrast with one's native speech, exhibiting new grammatical forms and new words as the images of things.

But science has brought the nations of the world nearer; and the intellectual, political, and social life of one affects all others. Every day new discoveries in art and science and in the relations of States are flashed across the sea. Other literatures are filled with the thought, the poetry, and the throbbing life of the century. The ancient world no longer fills the domain of knowledge, and new subjects of study demand recognition.

We pass from the classical method of study to the conversational method of acquiring language, not in all cases a real advance, but in the main a positive progress. Language was studied in its common forms: familiar expressions interpreted the formal grammatical rules, and impressed them upon the mind. But multitudinous exercises often meant perpetual revolution without progress. The entire time available for the student was spent in the exhausting study of exercises: little of the literature was read, and the new tongue became a confused and endless mass of idioms. Exercises were not merely used to illustrate grammatical principles, but became an end in themselves. Few students sought an acquaintance with German or French in order to speak these languages, and yet the entire time of the student was consumed in these exercises.

A *via media* was then attained by the production of grammars, scientific in arrangement, brief and clear in statement, with exercises sufficient to illustrate the rules: idioms were simply studied to facilitate translation.

The 'natural' method, or method of oral instruction, followed. The popularity of this system has been increased by its use in the various summer schools of languages. As an accompaniment of any course of study, this method possesses real merits. Its motto is, "Learn a foreign language as a child learns its mother-tongue." This system has also been applied to teaching the classics. It requires from the first the use of the language itself by the pupil. Brief sentences are learned, and then translated so as to assert, to ask, to command, and to express conditionality: the subject becomes in turn object, and the object subject. By continuing the process, the forms of the article, adjective, and the indirect cases of nouns and pronouns, are learned. Later the forms of tenses and modes are learned. This method trains pre-eminently the memory: as a phase of instruction, it is important and valuable, but when it claims exclusive possession of the field of languages, and seeks to dominate the entire system of instruction, it is not justified in supplanting established methods.

A noteworthy application of this method has been made in teaching Hebrew, and a modified form of it has been used in instruction by correspondence.

From the Hebrew text of the Bible a living language has been constructed, and made the vehicle for the expression of familiar

thought. In many cases the English text has been retranslated orally into Hebrew. A thousand students in a single year have been engaged in this study, and the Semitic languages are now subjects of study in this country to an extent unknown before.

The modern languages are far from full recognition in the courses of study in the greater number of colleges. The demand for their study as part of a liberal education is not emphasized by their position and the amount of time devoted to them. They are tolerated rather than regarded as essential. Out of sixty-four representative colleges, fifty-eight require neither French nor German for admission to the course in arts, four require French, and two either French or German. The colleges are thus reduced to the necessity of giving elementary instruction in the modern languages; and the college does not to this extent imply advanced instruction, but simply the teaching of the rudiments. A knowledge of French and German is necessary for the highest scientific as well as classical study. The use of French and German works, the consultation of authorities found only in these languages, is impossible if their study is postponed until late in the academic course. The colleges do not reap the fruits of a knowledge of the modern languages in their subsequent instruction. The philological study of Latin embraces law Latin and the forms that have survived in French and the other Romance languages. A critical knowledge of early English is not possible without a study of the French element in English derived from the Latin. Thus the advanced study of the classics, as well as our heritage of the English tongue, is dependent upon an acquaintance with French. The study of Anglo-Saxon is promoted by a preliminary knowledge of German. Our colleges are thus fettered in their work by the lack of the elementary knowledge on the part of pupils essential to its successful prosecution. An intelligent acquaintance with modern European literature is not possible when the time which should be devoted to it is occupied with elementary study. The time which is devoted to the modern languages forms in most institutions but a small part of the regular college course, necessitating imperfect and hasty study. In sixty-four colleges conferring the degree of bachelor of arts, the amount of time required to be spent in the study of French and German is seven and three-tenths per cent of the entire four years' course. It is required that less than four per cent of the entire time of the student shall be devoted to one of these languages. It is not to be assumed that this low amount adequately represents the entire time devoted to the modern languages, for through electives in the best colleges the study can be greatly extended; but it represents the current estimate of college faculties of the value of these studies, and the amount required to enable the student to prosecute his later work. During the same period, at least twenty-five per cent of the student's time is consumed, by compulsion, in classical study, in addition to the preliminary knowledge required before entering college. The revised curriculum which has been adopted at Yale, and other colleges where the strict classical requirement has not been retained in full force, is very encouraging. Several Western and Southern institutions, as the Universities of Michigan, Indiana, and Virginia, exhibit a thorough and extended course in the modern languages. The scientific and technical schools recognize the indispensable character of a knowledge of French and German for purposes of all advanced investigation in science and engineering. The most recent discoveries in these and allied branches are published in monographs and reviews, and it is safe to say that the highest expert testimony on a question of engineering cannot be secured except from one familiar with the constantly increasing results of foreign investigation. Such results are not immediately attainable except in the language itself; and the final word which has been uttered in discovery is often of priceless value in all industrial enterprises. There is a loss in the equipment of every scientist or engineer who cannot at once obtain from original sources the knowledge which he needs. There is an additional reason why the instruction in modern languages in our scientific courses should be increased rather than diminished. The requirements for admission to these courses are less than to the classical. An exclusively professional or technical course, unless conceived in a broad spirit, fails to give a view of the connection and relation of the physical sciences. No branch of study stands alone, and can be built up from itself. Geology embraces paleontology, and paleon-

tology demands a knowledge of animal and plant forms, hence of zoölogy and botany. Chemistry touches, on the one hand, organic forms, and, on the other, inorganic, and involves the laws of physics. The highest results in every field of learning demand the highest preparation for them, and the student going out into life will find a sphere corresponding with his highest fitness. It is a misfortune to educate men out of sympathy with other fields of knowledge. The scholar whose work will be confined to a single branch needs the broadest attainable culture, which would be impossible for him later. Knowledge loses half its value when it cannot be communicated clearly, forcibly, and persuasively. Thus the student with an exclusively practical life before him cannot dispense, even for success in his own department, with the culture which springs from a linguistic training. The scholar with a clear insight into the meaning of words, and the power to marshal his thoughts effectively, can make his knowledge useful to himself and the world. Any course, whether technical or scientific, which sends out graduates without that literary training which will give a commanding weight to their views in any community, is to that extent defective, and fails to prepare them for the widest usefulness. Minor defects in subordinate, technical matters can be more readily repaired by experience than a lack of linguistic training, which will give clearness and definiteness to their thinking, and make the publication of the results of their experience a contribution to the world's knowledge.

The experiment by which in certain courses the modern languages are substituted for the classical, is one of extended application in the colleges of this country. In many institutions the students in courses in philosophy and literature are more numerous than the classical students.

We conclude that the elementary study of French and German should be begun in the public schools; that there are years in youth in which languages are acquired with unusual facility, which should be improved in any system of education.

This would enable the instruction in the modern languages in colleges to be advanced in character, so that by their use the full value of a literary, scientific, or historical course could be realized.

By requiring French or German for admission to technical courses, the benefits of a thorough knowledge of these languages would be attained without crowding the strictly professional studies, and some literary study should accompany the whole four years' course in such schools.

W. T. HEWETT.

BRITISH UNIVERSITIES AND THE TRAINING OF TEACHERS.

THERE is no professorship of education at any university of England, Wales, or Ireland. At the universities of Cambridge and London there are special examinations for teachers, on the results of which certificates or diplomas are granted; but there are no educational degrees. Technically speaking, therefore, education is not a university subject in these countries. At Cambridge, under the auspices of a teachers' training syndicate appointed by the university early in 1879, lectures on teaching have been given for eight years past; but they are not permanently established, and may come to an end at any time. They are, as a rule, fitfully and poorly attended, and cannot as yet be pronounced a decided success. Except in the training-colleges and at the College of Preceptors, there is no other systematic course of lectures for teachers outside Scotland. In Scotland there are two chairs of education, established in 1876 out of funds left by the well-known Dr. Bell,—one at Edinburgh, and the other at St. Andrew's. Both these chairs are very ill endowed. In 1886 a school-masters' diploma was established at the University of Edinburgh.

I shall not attempt to criticise this state of things,—looked at from any point of view, it is far indeed from satisfactory,—but I shall endeavor in the space at my disposal to describe what is actually being done for the training of teachers by these various agencies.

I will begin with Cambridge, and first as to its courses of lectures. They usually consist of one set on psychology in its bearing on teaching, delivered as a rule by Mr. James Ward of Trinity College; another set on the history of education; and a series of dis-

connected lectures on practice delivered by prominent head masters and other teachers. Amongst these last may be mentioned as specially valuable the lectures on stimulus and on discipline, by Mr. Arthur Sidgwick, formerly an assistant master at Rugby; and one on 'A Day in a Class-Room,' by Dr. Abbott, head master of the City of London School. As far as I know, only one connected course of lectures on the practice of education has ever been delivered before the university; viz., that by Mr. Fitch, which has since appeared as his well-known 'Lectures on Teaching.' It may well be doubted whether the sporadic lectures by eminent school-masters above referred to can be properly said to form a part of training in any real sense; but they are certainly more attractive than a prolonged course, and are in many ways suggestive and stimulative. The reasons why these lectures as a whole are not more satisfactorily attended are mainly two, — first, because undergraduates, while reading for their degrees, have very little time to devote to other subjects; and, second, because it is the habit at our universities to look upon lectures as merely preparation for examinations, and to value examinations solely by the prizes attached to them. Now, there are no prizes attached to the teachers' examinations, and the head masters of our public schools practically ignore them altogether, while the University Agency for the supply of masters does not even mention the certificates on its form of qualifications. It is no wonder, therefore, that undergraduates do not crowd the lecture-room. It is only fair, however, to state that the lectures on education suffer no more than others under similar drawbacks. The writer of this paper, when lecturing at Cambridge a short while ago, on the history of education, can remember on one occasion to have counted as many as seventeen undergraduates present. At the time there were about nineteen hundred undergraduates at the university, of whom perhaps one-quarter were destined to become school-masters, at least for a time.

Before a candidate can enter for the examination of the Cambridge Teachers' Training Syndicate, he or she must have given evidence of something of the nature of a sound general education. The test is not, as at London and Edinburgh, that the candidate must be a graduate of the university. Some nine fairly simple examinations are named, one of which must have been passed; or, to make the condition still more elastic, the candidate must have "been presented for examination by a training-college approved by the syndicate." This lowering of the initial test, no doubt, still further removes education from the status of a university subject; but it renders the examination far more widely available, especially for women, who form about nine-tenths of the candidates as a rule. In the examination of June, 1886, held at the three centres, Cambridge, London, and Cheltenham, fifty-one candidates passed, of whom only three were men (students of the Finsbury Training-College). There are two certificates granted, — one for the theory, history, and practice of teaching; and, where this has been won, another may be obtained for practical efficiency in teaching. The subjects for the former are:—(1) The theory of education: (*a*) the scientific basis of the art of education, or pure psychology; (*b*) the elements of the art of education, or the application of psychology to school-work in the training of the faculties (the senses, memory, conception, etc.). (2) The history of education in Europe since the revival of learning, a general knowledge being required of systems of education which have actually existed, of the work of eminent teachers, and of the theories of leading writers on education up to the present time. A more detailed knowledge is required of special subjects set from year to year. For example, the special subjects for 1887 are, 'John Amos Comenius, his Life and Educational Works,' by Professor Laurie, and 'The Life and Work of Arnold;' those for 1888 will be 'Locke's Thoughts concerning Education,' and 'The Teaching of the Jansenists at Port Royal.' (3) The practice of education: (*a*) method, which deals with actual teaching and examination; (*b*) school management, which deals with hygiene, furniture, apparatus, time-tables, etc. One paper is set on each of three groups of subjects; and a fourth paper is added, containing a small number of questions of an advanced character on each of the three groups. It is into this paper that questions on physiology and physical training are usually introduced; but, notwithstanding this, I cannot but think that these last-named subjects are not sufficiently represented. Candidates

must be twenty years old before entering for the examination, and must pay a fee of fifty shillings to the syndicate.

The certificate for practical efficiency, as I have pointed out, can only be obtained by those who already hold the certificate which I have just described. Candidates must "have been engaged in school-work for a year in some school or schools recognized for the purpose by the syndicate." Training-colleges of course come under this designation, "if the syndicate is satisfied with the duration and character of the training in practical work received by the candidates." The bases for the certificate are, (*a*) examination of the class taught by the candidate; (*b*) an inspection of the class while being taught; (*c*) questions put to the teacher in private after the inspection; and (*d*) a report made by the head master or mistress. I do not think there have been many candidates for this certificate other than the students of those few training-colleges which are established for teachers of middle and higher schools. But then they are almost the only people who use the examination at all.

It may be as well to mention here that the syndicate does not prescribe the use of any particular books for its examination, except those mentioned under the head of 'special subjects.' Mr. Ward has, however, from time to time put forth a list of some of those books which may be safely recommended to students, and from which they can make their own choice. I need scarcely say that Dr. Barnard's admirable compilations play a prominent part in this list.

I have given a very full description of the Cambridge scheme, both because I consider it, on the whole, the best unconnected with a training-college in Great Britain, and because by so doing I shall be saved the trouble of entering into such minute detail again. Let me mention here, for the information of the curious in such matters, that in the charter of Cavendish College, founded at Cambridge in 1876, the objects mentioned are, "(1) To enable students somewhat younger than ordinary undergraduates to pass through a university course, and obtain a university degree; (2) To train in the art of teaching those students who intend to become school-masters; (3) To secure the greatest possible economy in cost as well as time." I cannot ascertain that any steps have ever been taken to realize the second object. Probably all that was meant was that the college was intended to provide 'pupil-teachers' in the elementary schools, with an opportunity for finishing their general education. Who knows but that some day we may get it to mean both that and something more?

The University of London is simply a corporation for examination purposes. It provides no lectures of any kind; that is, it does not educate, but only tests education. It is hoped by many that before very long this state of things may be changed; but for the present the fact stands as I have stated it. For the present, therefore, the only part the University of London can play in the higher training of teachers is that of an examiner. As I have already said, it possesses an 'examination in the art, theory, and history of teaching.' Unlike the University of Cambridge, it restricts its examination to its own graduates, and it grants a 'teacher's diploma' on the result. There is no restriction as to age, and the fee is five pounds. Four papers are set, — one on 'mental and moral science in their relation to the work of teaching;' two on 'methods of teaching and school management;' and one on 'the history of education.' The science and the methods are very much the same as at Cambridge; but the history consists solely of set books. It is described as "the lives and work of eminent teachers, and the systems of instruction adopted in foreign countries." The set books for 1887 are as follows: 'History of the University of Cambridge from the Earliest Times to 1535 A.D.' by Bass Mullinger; 'Education and School,' 'Theory and Practice of Teaching,' by E. Thring; 'On the Action of Examinations,' by Latham; 'Quelques mots sur l'Instruction publique en France,' by Michel Bréal.

There are no doubt great advantages in the direction of definiteness and thoroughness to be derived from the use of set books; but, on the other hand, it leads to this unsatisfactory position, — that in 1887 teachers will gain their diploma without having shown any particular knowledge of the public instruction of England, Germany, and Switzerland, and, what is worse, without having shown any particular knowledge of the theories and methods of Froebel and Pestalozzi. As a matter of fact, one or two questions on these last

are generally introduced into the other papers. It may be well to note that among the many things coming under the head of methods of teaching and school management we find mentioned physical exercises, drill, and recreation. But there is another point of still greater importance. The University of London grants but one certificate,—not two, as does Cambridge,—and includes in that one, as a *sine qua non*, practical skill in teaching and in the management of a class. No directions are given as to how this last and most difficult test is to be applied. But hitherto the plan adopted has been to require the candidates to send in sketches of lessons on four different subjects chosen by themselves, and to give one or two of these lessons to a class in the presence of the examiners. But inasmuch as, in the necessity of things, such classes as can be got near at hand have to be chosen, the teachers know nothing personally of the children, and are quite in the dark as to the actual knowledge which the class possesses. The consequence is, that the test is far from satisfactory, and merely serves to show what a teacher will do under very distressing circumstances. At the best, it can only reveal whether a teacher is altogether incompetent: all the higher qualities must remain unassessed. A large part of those who take degrees at the University of London are the teachers of elementary and middle schools; and these, by the time they have graduated, have already had many years of school experience: hence the insistence on the practical test as an integral part of the London examination for teachers. The Cambridge examination is rather designed for those who intend to become school-masters and school-mistresses. The London examination has only been in existence some three or four years, and so far has been but very little made use of.

As I said at the commencement, there are two chairs of pedagogy in Scotland,—one at the University of Edinburgh, and the other at the University of St. Andrew's. Their work is sufficiently alike to allow one description to do for both. I will choose the chair of Edinburgh, held by Prof. S. S. Laurie.¹ This chair was founded in 1876, and commenced work with fourteen students,—a number which has steadily been added to, until the total has now reached fifty-one. Of these students, about three-fifths are 'senior students' of the denominational training-colleges, who, having passed a qualifying examination in Latin and mathematics, and stood in the first division of the government list of successful candidates for Queen's scholarships (i.e., entrance scholarships at the training-colleges), are allowed to attend the university. The remainder are students who have graduated or are about to graduate. This latter class will not be likely to attend in larger numbers until either the subject of education is included in the studies qualifying for an M.A. degree, or an act is passed requiring all school-masters in Scotland above the elementary grade to hold a diploma in education. A long course of eighty-five lectures is delivered between the first of November and the first of April. Of these lectures, about a dozen are purely psychological, dealing with the intelligence and moral nature; fifty are on method, dealing with principles of teaching and the detailed application of these; the rest are on the history of education. These last naturally vary considerably from year to year; but every year a careful analysis of Quintilian and Locke is given. I must confess that the choice of these two last as staple subjects seems to me peculiar. All the students attend three examinations, and write three essays. These form the subject of professorial criticism. Those students who have not been, or who are not, training-college students practise the art of teaching in the normal schools (by permission), and are examined by the head masters of those schools on practical matters of school management. The head masters report to the professor. Last year the university instituted a school-masters' diploma specially for secondary school-masters, which, however, is to be conferred only on graduates in arts of Edinburgh. Candidates, moreover, must have attended the class of the theory, art, and history of education in the university, and must pass an examination in these subjects conducted by the professor and an examiner appointed by the university court. The subjects of examination in April, 1887, were, (a) the professor's lectures; (b) Locke, 'On the Conduct of the Human Understanding'; (c) Milton, 'Tractate on Education'; (d) Comenius, 'Great

¹ The chair at St. Andrew's is held by Prof. J. M. D. Meiklejohn, whose name and work must be well known in the United States.

Didactic.' Each candidate must further give evidence either that he has attended a course of practical instruction in a training-college; or that he possesses the government qualification in the practice of teaching required of graduates and provided in the 'Scottish Code'; or that he has taught publicly for at least one year in a school, and holds such a certificate of practical skill from the head master as may be considered satisfactory by the university. Lastly, each candidate must satisfy the university of his practical aptitude as a teacher in some special subject or subjects in which he has received instruction in the university or in any institution recognized by the university as qualifying for degrees. I may note in conclusion that the fee for the diploma is two guineas. I have not yet been able to ascertain whether St. Andrew's is likely to follow the lead of Edinburgh in instituting a school-masters' diploma.

It only remains for me to speak of the College of Preceptors in London. This institution provides three courses of evening lectures for teachers, and confers diplomas of three grades,—associateship, licentiate, and fellowship. The lectures are on (a) psychology and its relation to teaching; (b) practical teaching; and (c) the history of education. The courses used to consist of ten lectures each; but in future the number of lectures on the first two subjects will be doubled. They are open free to all members of the college (annual subscription one guinea), or to any one else on payment of half a guinea for each course.

The examinations for the three kinds of diploma all include tests of a general education of gradually increasing severity; but these tests may be omitted in the cases of persons possessing a university degree, or who have passed some examination equally satisfactory to the college. What most concerns us here are the strictly pedagogic subjects. To begin, then, with the associateship. Candidates must give evidence of having been at least one year engaged in teaching, or of having attended a year's course of the lectures for teachers at the college. The subjects are, (1) the elements of mental and moral science; (2) physiology, with special reference to its application to the laws of health and to physical and mental education; and (3) lesson-giving and criticism of methods, including the sketching of a lesson on some assigned subject, the suggesting and discussing of cases of difficulty in teaching and discipline, and the proposing and criticising of methods. For the licentiate the candidates must give evidence of having been at least two years engaged in teaching. The subjects are the same as for the associateship, with the addition of logic in its application to education; while the third section now includes "a thesis on the life, character, methods, and influence of some distinguished educator to be selected by the candidate, or a description of the organization and methods of some school of repute derived from personal inspection and examination." The candidates for the fellowship must give evidence of having been not less than five years engaged in teaching. Sections No. 1 and No. 2 are the same as before, but of a more advanced character. Section 3 becomes "government of a school, including lesson-giving and school organization in all its departments." Section 4 is "the history of education and educational methods, with studies of distinguished educators, English and foreign; and a description and discussion of the methods and organization of schools and colleges of note at home and abroad." The fees in the first case, for examination and diploma together, are two guineas; in the second, three guineas; and in the third, six guineas. Examinations are held twice a year,—at midsummer and Christmas. During 1886, for the three diplomas together, 136 candidates entered,—70 men and 66 women. Of these, 45 obtained the associateship, 4 the licentiate, and 1 the fellowship. This will serve to show both how much the examinations are used, and the severity observed in awarding the diplomas.

I fear that all this will read as a very dry statistical account. It would have been pleasanter and easier to have flowered forth into criticism and exhortation; but those who really wish to know how matters now stand, will, I believe, find my facts more useful than my views are ever likely to be. H. COURTHOPE BOWEN.

THE total number of children within the age of compulsory school years in Prussia is 5,500,000, of whom 4,800,000 attend school. There are more than 700,000 teachers, in 33,000 elementary schools. The average number of pupils to one teacher is 78.

EXPLORATION AND TRAVEL.

Brazil.

DR. HASSLER, who returned last April from an interesting journey through the Brazilian province of Matto Grosso, has described the results of his journey in a lecture delivered before the Geographical Society of Bern. The expedition, which was organized by the Brazilian Government, consisted of Dr. Hassler, an Englishman, a Brazilian lieutenant with forty soldiers, and several natives. They ascended the Paraguay, and began their explorations from Cuyabá, the capital of Matto Grosso. Having ascended the Rio Cuyabá, they crossed the divide between the La Plata and Amazon systems, and tried to reach the Rio des Mortes. Having first struck the little-known rivers feeding the Xingú, they found the Rio des Mortes, which they descended to its confluence with the Araguaya, and followed the latter river to its confluence with the Tocantins. They returned by the Araguaya, and, having traversed an extensive part of the plateau of Matto Grosso, they reached the Rio Lourenço, and returned by this way to Asuncion. Dr. Hassler discovered and explored several large tributaries of the Araguaya. The region traversed by this expedition is not far east from where Von der Steinen made his important discoveries in 1883, and the results of this journey will undoubtedly form a valuable contribution to our knowledge of the geography of central Brazil. The topography of the plateau of Matto Grosso and of its northern slope is little known, and it is fortunate that the Brazilian Government should at last undertake the exploration of this extensive country. Dr. von der Steinen, who is now on his way to the sources of the Xingú, was unable to carry out his plan, to reach the Matto Grosso from the east coast of Brazil, but had to take the Paraguay route. His last letter is from Cuyabá. The expedition was detained in Brazil by the prevalence of cholera in the Argentine Republic. They used this time for exploring the *sambagui* (or shell-heaps) of Santa Catharina. They intended to start from Cuyabá to the head waters of the Xingú, where they will establish a camp and study the interesting Indian tribes inhabiting this remote region.

NEW GUINEA.—Since we published the sketch-map of New Guinea in No. 242 of *Science*, several interesting reports on new journeys have been published. Dr. Schrader, the leader of the expedition of the New Guinea Company, has ascended the Augusta River in a small steamer some distance beyond the point reached on the first expedition. The Proceedings of the Royal Geographical Society say that Mr. C. H. Hartwig and Mr. G. Hunter succeeded last July in reaching the summit of the Owen Stanley Range. They appear not to have reached the highest elevations, but by a judicious choice of route, along the valleys of the Kemp Welsh and Musgrave Rivers, ascended to the saddle between Mounts Obree and Brown, and crossed to the eastern or inland slope of the range. They started with twenty-seven friendly natives, but had some difficulty, in commencing the ascent, with the hostile tribe who guard the great mountain Paramagoro, which they believe to be the abode of the spirits of the departed. Their hostility was eventually overcome by peaceable measures, and upward of two hundred of them followed the expedition in the ascent, conciliated by the daily supply of meat of wild pigs, which the travellers obtained by means of their rifles, though the chief cause of the success is attributed to the great experience of Mr. Hunter, who had for a long time prepared for the expedition by making friends with the tribes, several of whose languages he speaks fluently. The flora is described as magnificent in the extreme, including palms of many species, tree-ferns, marantas, orchids, and an endless variety of tropical flowering plants. East of the range the country is more open and richly grassed. The same number of that journal contains a full report of the discovery of two large rivers, the Douglas and Jubilee Rivers, emptying at the head of the Gulf of Papua, accompanied by a map and several illustrations. Their discovery was mentioned in a recent issue of *Science*. The well-known traveller, Capt. Adrian Jacobsen, has been sent out to New Guinea and the neighboring islands by the Ethnological Museum of Berlin, principally for making collections among the various Papuan tribes.

TIMBUKTU.—Timbuktu and the upper Niger have lately attracted considerable attention. The French are rapidly extending their possessions toward this important place, starting from the

Senegal. The Geographical Society of Paris has published several sketch-maps showing the advance that has recently been made. The upper Gambia and the neighboring districts have been surveyed, and extensive stretches of land on the upper Niger have been placed under French protectorate, which now extends from the right bank of the Niger to Sierra Leone and Liberia, including the whole of Futa-Djallon. Roads are being built, and much advance is being made in our knowledge of these districts. While this is a safe and reliable way of progress, Mr. George Angeli's scheme of a railway from Cape Juby to Timbuktu seems rather vague, and unlikely to be carried out. Of great interest is an approach to the upper Niger by Dr. A. Krause through a country which was formerly considered impenetrable. We mentioned the beginning of his journey, on which he started from the Gold Coast, in No. 218 of *Science*. He succeeded in entering the totally unknown region in the great bend of the Niger, but had to return when about one hundred and fifty miles from Timbuktu. The results of this journey will be of great importance. As it is generally accepted that journeys in Africa are very expensive, it will be of interest to learn that Krause had no more than twenty-five dollars on landing.

STANLEY FALLS.—The London *Times* publishes an interesting letter of Major Barttelot on the state of affairs in Central Africa. This letter makes it clear that Tippu-Tip's authority in Stanley Falls is very limited, and that he will require support from the Kongo Free State to suppress the slave-hunters, who extend their raids almost to the confluence of the Aruvimi. The Kongo Free State has decided to send some troops to his assistance, and, in case this effort should prove unsuccessful, to endeavor to obtain the support of the Sultan of Zanzibar. If Tippu-Tip is true to his obligations, it may be that the efforts of the state will be successful.

HEALTH MATTERS.

Vital Statistics in Massachusetts.

THE Massachusetts State Board of Health has issued the forty-fifth registration report of that State, containing the vital statistics for the year 1886. During this year the public health has markedly improved; the birth-rate being greater, and the death-rate less, than in any other year since 1879. 50,788 births, 18,018 marriages, and 37,244 deaths were recorded, being an increase of 1,998 births and 966 marriages, and a decrease of 850 deaths, as compared with 1885. The death-rate was 18.85; the birth-rate, 25.69; and the marriage-rate, 9.12. The number of illegitimate births was 1,034, or 20.3 per thousand. The rate in Russia is 29, and in Bavaria 152, the average for Europe being 64. In Massachusetts, and also in Rhode Island, Connecticut, and Vermont, as well as in most countries of Europe, the marriage-rate has decreased during the past twenty-five years. 601 divorces were granted during 1886, 45 less than in 1885, but 105 more than the average for the preceding twenty years. Of these, 20.8 per cent were for adultery, 45.7 for desertion, 16.3 for intoxication, 5.3 for extreme cruelty, 10.3 for cruel and abusive treatment, and 1.2 for neglect to provide maintenance. The infant mortality was greater than in any year since 1875, and also greater than the average of the past fifteen years. The average age of all persons at death was 34 years, the extremes being 48.63 in Barnstable County, and 30.29 in Suffolk. The ratio of deaths from zymotic diseases to all deaths has steadily decreased from 28.6 in 1876, to 18.5 in 1886. The death-rate from consumption has decreased from 3.25 per thousand in 1867, to 2.98 in 1886; that from cancer has, during the same period, increased from 0.29 to 0.56. During the ten years ending 1886, there have been the following deaths: from typhoid-fever, 8,466; from whooping-cough, 2,765; from diphtheria, 15,288; from measles, 1,832; from scarlet-fever, 5,130; and from small-pox, 193. The increase in the mortality from diseases of the brain during the past twenty-five years is very marked. In 1865 the rate per ten thousand for this class of disorders was 12.06; in 1865, 14.39; in 1870, 14.35; in 1875, 16.42; in 1880, 17.00; and in 1885, 20.01. In this class are included apoplexy, softening of the brain, paralysis, insanity, cephalitis, and brain disorders generally. There were but 32 deaths reported from ague and remittent fever during the year: 62.5 per cent of these were in the five western counties, having but twenty-six per cent of

the population. One-fourth of the whole number occurred in Hampden County. Eastern Massachusetts suffered severely from malarial fevers in 1884, 1885, and 1886, but few of the cases, however, proved fatal.

MICHIGAN SANITARY CONVENTION.—A sanitary convention is to be held at Albion, Mich., under the auspices of the State Board of Health, Dec. 6 and 7. The objects of the convention are the presentation of facts, the comparison of views, and the discussion of methods relating to the prevention of sickness and deaths, and the improvement of the conditions of living. It is intended to be a convention of the people generally. Among the subjects which it is expected will be presented and discussed are the following: 1. The present and future water-supply of Albion; 2. Disposal of waste in Albion by sewerage and otherwise; 3. School hygiene; 4. Money-value of sanitary work; 5. Restriction and prevention of communicable diseases, from four standpoints,—(a) of the State Board of Health, (b) of the health-officer, (c) of the clergyman, (d) of the lawyer.

CHLOROFORMING WHILE ASLEEP.—We had occasion in a recent number of *Science* to refer to the possibility of chloroforming persons while asleep without awaking them. In confirmation of the statement which was then made, that under favorable circumstances this could be accomplished, we quote a case which occurred in the New Orleans Charity Hospital and is reported in the *New Orleans Medical and Surgical Journal*. A child six years of age was suffering from pleurisy, and it became necessary to draw off the fluid effusion which had accumulated in his chest. He was very much afraid of the operation, and it was determined to attempt it while he was asleep. On the following day, while sound asleep, chloroform was administered without awaking the child, and twenty-four ounces of fluid were withdrawn. The child continued to sleep throughout the night, and when it awoke the following morning knew nothing of the operation.

FLIES AS CARRIERS OF CONTAGION.—A report was made to the French Academy of Sciences by Spillman and Hanshalter, giving the results of their investigations into the possibility of flies acting as carriers of contagion. These observers examined the excrement and intestines of flies that had fed on the contents of spit-cups used by consumptive patients, and found the bacilli of consumption in abundance. These bacilli were also found in the dried excrements of flies scraped from the windows and walls of rooms occupied by consumptives. These facts are in perfect consonance with the recommendations of the American Public Health Association, that the sputa of consumptive patients should be received in vessels in which disinfectants have been placed.

THE PLYMOUTH TYPHOID EPIDEMIC.—Our readers will remember the epidemic of typhoid-fever which created such consternation in Plymouth, Penn., in 1885. The population at that time was 8,000. Of these, 1,153 contracted the fever, and 114 died, a mortality of nearly 10.33 per cent. It is now stated that typhoid again prevails to an unusual extent in Plymouth, and that fears are entertained of another epidemic. There are said to be thirty cases of the fever there at the present time. In connection with the subject of typhoid-fever, there have been reported in France three cases in which the disease seems to have been transmitted through the air. A patient suffering with typhoid-fever stopped at a hotel in Eaux-Bonnes. In four weeks she recovered, but the three daughters of the hotel-keeper were attacked. Eaux-Bonnes is said to have a bountiful supply of excellent spring water, and there was no other case of typhoid in the town. The discharges from the stranger were thrown, in an undisinfected state, into the water-closet, the door of which communicated with the room in which the landlord's daughters slept, at a distance of only three feet. It seems reasonable in this instance to eliminate the drinking-water from the factors in causing these three cases, and to charge the infection to the neglect of disinfection of the excreta.

SEASICKNESS.—The *Semaine Médicale* contains the views of Dr. W. Skinner on seasickness. He looks upon it as the expression of certain purely functional or dynamic disturbances of the organism, some of the symptoms indicating a general fall of the arterial blood-pressure. The starting-point is probably a reflex inhibition

coming from the sensorium or from the nerves of the abdominal organs, which is brought about by a contusion or stretching of these organs due to the motions of the vessel. His treatment consists in the use of vaso-motor stimulants, strychnia, atropia, and caffeine, introducing them hypodermically. Dr. Skinner reports thirty-nine cases in which his treatment was efficacious, one of them being an infant of two years and a half.

HYDROPHOBIA.—In the latter part of September three children died in England from hydrophobia, having been bitten by rabid dogs. Their mother was bitten at the same time, and has gone to Paris to be treated by Pasteur. Another child, not of the same family, was bitten by a rabid dog at Lancaster. Seven days after, he went to Paris, where he remained a month under treatment. The day after his return the first symptoms of hydrophobia appeared, and in two days proved fatal.

YELLOW-FEVER AT TAMPA.—Dr. Porter, president of the Key West Board of Health, has gone to Tampa, Fla. He reports that the disease which lately appeared there is undoubtedly yellow-fever. To Oct. 14, there had been eighty cases, of which twelve had proved fatal.

MENTAL SCIENCE.

Bilateral Asymmetry of Motion.

DR. J. LOEB of the University of Würzburg has made some very interesting observations on the motion of the two arms. A thread is stretched between two uprights at such a height, that, with the fore-arm bent at a right angle at the elbow, it can be conveniently held between the thumb and forefinger of either hand. In the first series of observations, the two hands started together at the middle of the string, and moved outwards to either side until signalled to stop by the experimenter. The object was to move the two hands with equal speed; but it was found that every subject either constantly moved the right hand farther than the left, or the left constantly farther than the right. Right-handed persons who were not handicraftsmen, usually allowed the right hand to make the longer excursion, and contrariwise for the left-handed. The difference between the movements of the two hands varied from one-tenth to one-half of the space moved over. If, instead of the operator's signal, a clamp was placed upon the thread on one side to indicate when the subject should stop, the general result was the same, though the hand on the side of the clamp usually moved more cautiously.

Thinking it probable that the difference was due to the difference in the nature of the voluntary impulse imparted to the two hands, Dr. Loeb himself moved one of the subject's hands to one side, while the latter was to simultaneously move the other out to an equal distance. But the result was as before: the asymmetry constant for each person remained; and that, too, no matter whether the right hand was passively moved and the left hand moved voluntarily, or the reverse. The size of the error, however, is reduced in the sense, that, compared with a voluntary motion under the same conditions, a passive motion seems larger. This Dr. Loeb thinks may be due to the fact that there was a conscious fear of moving the active hand too far, and that the attempt to correct this resulted in an error in the opposite direction. All the above observations were made upon persons ignorant of the resulting asymmetry. Those who were informed of the result, or discovered it for themselves, thereafter much diminished their error.

The next variation consisted in having the two hands move, not in opposite, but in the same direction; that is, either with the left hand starting in the middle and the right hand to the right side to move towards the left, or with the right hand in the middle and the left hand to the left side to move towards the right. As before, the two movements were simultaneous, were to be made equal in extent, and the motion of one hand was arrested by a clamp set upon the string. Here a new law enters; and the result is, that, independently of the hand and of the direction of the motion, the motion from the exterior towards the middle is always distinctly larger than from the middle towards the exterior.

To eliminate the asymmetry between the two hands, the experiment was made with one hand only, first moving out a given dis-

tance, and then attempting to repeat the motion. The general result was, that the reproduced motion was larger than the original, when the motion was made on the hand's own side,—for the right hand on the right side, and for the left hand on the left.

In conclusion, Dr. Loeb asks the question, "On what basis does the mind conclude that the motions of the two hands are equal?" He answers that it is due to the time element. There is an unconscious attempt to translate space into time, because we can judge the latter more accurately; and, in several series of experiments in which the time was recorded, it was found, that, even when the two hands moved quite different distances, the times of the two motions were approximately the same. The mind, then, judges two motions to be the same when they are innervated by equally intense impulses, and consume equal times; and the asymmetry is referred to the fact (due to increased practice, or what not) that an equal impulse will impart a larger motion to the one (the preferred) hand. That other factors enter into the problem is not to be doubted: for example, if one thread is rough and the other smooth, the same distance on each will seem longer on the rough thread, by more frequently stimulating the skin. Dr. Loeb promises a continuation of the observations.

FALSE TESTIMONY OF CHILDREN.—The trial at Tisza-Eszlar is probably sufficiently well in mind to serve as a type of the false evidence given by children. Dr. A. Motet has collected a number of similar cases, and shows very distinctly that the children in question are quite generally the subjects of morbid tendencies. Frequently they are the offspring of a degenerate stock, and are characterized by weakness of will, and a love for excitement. The analogy between these suggestions accepted and elaborated by these children in a waking condition, and precisely the same phenomena in hypnotic states, is evident. Dr. Motet suggests several hints by which such testimony can be prevented from imposing upon the courts, and urges that a careful physician be summoned when any such suspicious testimony by a child is deposed. It illustrates anew the close connection between responsibility and nervous affections as well as between the doctor's study and the court's dictum.

SMELL AND TOUCH VERSUS SIGHT.—Dr. Fauvelle calls attention to the inverse relation between the development of the visual and the olfactory apparatus, and holds that smell, when supported by touch, can in some forms of life outweigh sight. The snout, when it occurs, is always at the most anterior portion of the body in progression, and through this heralding position becomes endowed with a most delicate sensibility, often of mobility too, and at the same time brings into prominence the olfactory mechanism. The changes in the form of this naso-labial organ of touch follow all the changes in the prominence of the organ of smell, and prevent a special development of the organ of vision. In man and the primates this loses its importance and yields to sight, which superiority is assigned to the parallelism of the visual axes, and establishing of the biped position, where the organ of smell is no longer at a prominently anterior position of the body.

BOOK-REVIEWS.

Industrial Education, a Guide to Manual Training. By SAMUEL G. LOVE. New York and Chicago, E. L. Kellogg & Co. 8°.

It is inevitable that there should spring up in the earlier stages of a movement for educational reform a large literature. Some of this will naturally be good; but much of it, owing to superficial knowledge or misconception, will be bad. Public opinion on the reform in question is in large measure formed by these early books, and for that reason, if for none other, the critic should scan them with great care.

Mr. Love's book is one of the first in this country that undertakes to explain in detail what manual training really means; and, as a great many people are just now asking the very question which it professes to answer, it will naturally have a large number of readers. But it is extremely important that only correct information should be given concerning manual training, and that one or two sources of general confusion as to its purpose and aim should be removed.

We have read Mr. Love's book carefully with these points in view. The book is divided into five parts and an introduction. The first part discusses the claims of manual training, and the second describes what has been done in Jamestown, N.Y.,—in which town Mr. Love is superintendent of schools,—in development of this training, and gives the course of study pursued therein. The third, fourth, and fifth parts discuss the organization and carrying-out of manual training in the various grades of the primary, grammar, and high schools, respectively. Mr. Love has worked conscientiously, and has beyond question accomplished a great deal of good. His fellow-citizens seem (pp. 27-29) to approve his work, and to be in harmony with his ideas. But, we regret to say, taking Mr. Love's own language as the expression of his ideas, he himself is still very much in the dark as to what the movement in favor of manual training really signifies.

Those persons who have an insight into the real aim of manual training know how difficult it is to make others understand that the manual training urged is mental training: for no one who understands our public-school education would for a moment urge that any thing which is not purely and simply educational should find a place in it. Manual training would not train the hand *per se*, but the hand as the servant of the mind, and as one of the mind's agents of expression. Manual training, which is technical and not mental, must be provided for, but apart from and not in the public schools. This has been insisted upon so often lately, that we had hoped the point was clear to all, and it is extremely discouraging to find Superintendent Love marking off his manual training as something foreign to mental training, as he explicitly does in several passages of his introduction, and impliedly does throughout the book. In fact, the author's idea is that manual training should be added on to the school course, as a matter of privilege. The correct idea is that manual training should be incorporated in the common-school course as a matter of right. The two conceptions differ widely in theory, and still more in practice. For example: the clear-sighted advocate of manual training would never urge, as does the author (p. 7), that it should be introduced because "very many children dislike books." This argument, if pursued logically, would create havoc in any system of education.

Every once in a while the author seems to approximate the proper point of view, as when (p. 33 *et passim*) he classifies writing, drawing, gymnastics, and card-board work together under the head of manual training. But when we turn to his carpentry course, and see how wholly blind he is to the proper relation of drawing to constructive work, we despair again.

Minor criticisms might be passed on various portions of the book, but this fatal misconception of manual training in general renders them unnecessary.

Superintendent Love has proved to the satisfaction of himself and his townsmen that the old-fashioned curriculum does not satisfy the educational demands of to-day, and in adopting manual training he did a wise thing; but his book proves that he adopted it for the wrong reasons and in the wrong way.

Philosophy of Theism. By BORDEN P. BOWNE. New York, Harper. 8°.

PROFESSOR BOWNE'S reputation as a thinker rests on a secure foundation, and that alone would entitle this his latest volume to careful consideration. But the 'Philosophy of Theism' will command attention and respect on its own account, for it is in many ways a remarkable book.

In the first place, it is a new evidence of the interest now being taken in the philosophy of religion, and may well take a place beside the volumes of Flint, Diman, Fisher, and others as a masterly exposition of the theistic argument. It is superior in profundity to the recent philosophico-religious books of Royce and Abbott, although we miss in it some of the flashes of brilliancy which make the latter books such interesting reading and constitute so much of their charm.

But Professor Bowne's aim in the work before us is not, as it seems to us, wholly religious. He aims to show that both theism and modern science stand upon a common substructure; namely, the philosophy of belief or faith. Indeed, the author goes even

further than this. He claims that a common postulate underlies not only theism and natural science, but our whole mental life. His position may best be elucidated by this passage from the preface: "Kant pointed out that the ontological argument properly proves nothing, and that the cosmological and design arguments depend on the ontological. The argument, then, is not demonstrative, and rests finally on the assumed existence of a perfect being. In a different form I have maintained the same position; but, so far from concluding that theistic faith is baseless, I have sought to show that essentially the same postulate underlies our entire mental life. There is an element of faith and volition latent in all our theorizing. Where we cannot prove, we believe. Where we cannot demonstrate we choose sides. This element of faith cannot be escaped in any field of thought, and without it the truth is helpless and dumb."

Professor Bowne starts with the very evident fact that man is religious. He points out that we may properly inquire as to the source of religion, as to its history, and as to its foundation. Merely pausing to aim a shaft at that sensationalistic philosophy which would trace religion to some non-religious sources, the author sets aside the first two questions as beyond his province, and addresses himself to the third. In an analysis of the data of the religious consciousness, it is conceivable that one of these results might be reached. Either the theistic idea might be found to be (1) contradictory or absurd; (2) an implication of the religious sentiment only, and without any significance for pure intellect; or (3) a demand of our entire nature, intellectual, moral, æsthetic, and religious. To establish the last alternative is Professor Bowne's aim in this volume. He paves the way for his constructive argument by pointing out the unnaturalness of subjective idealism and the irrationality of chronic scepticism. It is not possible for us to follow the author's elaborate argument. He aims to establish on the principle noted above, the unity of the world-ground and then its intelligence and personality. Its metaphysical attributes, its ethical nature, and its relation to the world, form the subjects of subsequent chapters. The influence of Lotze, so strongly marked in the author's work on metaphysics, is still seen here, and particularly in his treatment of interaction. A brief concluding chapter passes from the intellectual to the practical applications of the theistic implication. The steps in the closely reasoned argument can hardly be indicated without doing them an injustice. We therefore refrain from making the attempt, and earnestly commend Professor Bowne's book to all philosophical students. Even where it fails to convince, it will stimulate and enlighten.

NOTES AND NEWS.

THE death has been announced of Gustav Robert Kirchhoff, the famous physicist. He was born March 24, 1824, and became lecturer of physics at the University of Berlin in 1847. In 1850 he was appointed professor in Breslau, and in 1854 in Heidelberg. It was here that he and Bunsen made their famous optical researches which led to the discovery of spectral analysis. The results of these investigations were published in Berlin in 1861, under the title 'Untersuchungen über das Sonnenspectrum und die Spectren der chemischen Elemente.' It is well known that these discoveries were the foundation of astrophysics, and that they led to numerous unexpected discoveries in chemistry. But this is only one of Kirchhoff's important works, which covered all parts of mathematical physics, particularly the theories of electricity, galvanism, and elasticity. In 1875 he accepted the professorship of physics at the University of Berlin.

LETTERS TO THE EDITOR.

Romantic Love and Personal Beauty.

YOUR correspondent of Oct. 14 might have observed a feature in this book which would have explained and justified the repulsion she felt in reading it. The author cannot resist the temptation to be funny. He may be coarse, or refined; but he must be witty. He cannot carry us along in an uninterrupted narrative of sober and well-digested facts. He must stop to make us laugh, or suffuse his pages with ill-disguised humor that constantly divides our interest between fact and fancy. This is hardly tolerable in what aims to be in many respects a scientific discussion. It spoils both

its science and its wit. The instance quoted, "Did Herbert Spencer ever kiss a girl?" is not a solitary one. French and German girls simulating horror of some men whom "they secretly consider a darling creature," he says, have a "spring-chicken coyness." Of a certain class he says, "It would be absurd to include in this statement people of refinement, who through misfortune have been plunged into abject poverty. They do not belong to the '*Great Unwashed*' (οἱ πολλοί)." Again: "The modern ideal of woman is exclusively feminine, i.e., devoid of hackles, spurs, cock-a-doodle-doo, and pugnacity." "As for those old maids who are neither ugly nor masculine, some of them are quondam coquettes, who practised their arts just one season too long, and '*got left*' in consequence." "There is one difference between undervalued men of genius and old maids: the men of genius admit that they are in advance of their age, and are proud of it; the old maids never, at least *hardly ever*." Then, in the passage about woman's universal tendency to fall in love with officers, he says it is not because of their valor: "for they have perhaps never yet been opposite the '*business end*' of a rifle." If you want to win a woman's love, "put brass buttons on your coat, have it dyed blue, and wear epaulettes and a waxed mustache. This love charm *has never been known to fail*." "What is fat? It is an accumulation of unburnt *body-fuse*." Then this generalization of woman's love: "O Arthur! how happy I would be alone with you on a quiet island in the distant ocean!"—"Have you any other desire, dearest Ella?"—"Oh, yes! do get me a season-ticket for the opera." "As a rule, the preliminaries to animal marriages are doubtless brief. If a healthy, vigorous male comes across a mature, healthy female, it is usually a case of mutual *veni, vidi, vici*." We might go on with pp. 5, 6, 9, 11, 22, 38, 103, 114, 122, 123, 164, 196, and no doubt to the end of the book, with numerous instances of just such coarse humor in a scientific work. We have referred only to the most striking, and his pages everywhere abound in the use of some word or phrase that takes all the color of seriousness out of the narrative. Nor is the trait of which we complain confined to this book. In a letter to the *Nation* of Oct. 20, the same author, speaking of Oregon, which he says is called "Boomland," could not resist adding: "As I write, I hear a mother scolding her baby for putting a handful of dirt in her mouth. Real estate is too valuable hereabouts to be thus squandered in luxurious living."

Such a man cannot write science. He cannot state rightly a plain fact: he can only see fun, and that of the coarsest kind too frequently. It is provokingly offensive in such a mass of facts as this book collects, because there is such a mixture of things which we have to consider seriously, along with the absurd. But at the same time you cannot take it so seriously as to condemn his theories: for you may be criticising an exhibition of wit or a joke. On the other hand, too many of his facts are collected from poetry, newspapers, and the by-paths of literature, to possess either psychological value or scientific interest. It is only his pedantic references to evolution, sexual selection, etc., which every one must take seriously to-day, and some pertinent moral reflections on customs and manners, that can give any flavor of scientific earnestness at all to the book. The encyclopedic collection of facts and quotations makes it seem pretentiously scientific, and no doubt much of it is intended to be; but the flippant tone everywhere visible, and its humorous levity so frequent, ought to disarm all serious censure except for bad taste. His use of evolution is not dangerous, because he has only a dilettante's knowledge of it. The book needs 'editing.'

J. H. H.

Answers.

15. IS THE TRUMPET-CREEPER POISONOUS?—While I was in south-west Missouri during 1879, I found a general belief that the trumpet-vine (*Tecoma radicans*) was poison to the touch, like *Rhus toxicodendron*. Upon investigation, however, I found that most people were in the habit of confounding the two, *Rhus toxicodendron* there climbing to the tops of tall trees, often having stems three or four inches in diameter, the external characteristics of the two vines being somewhat alike. I could not learn that the idea had any other foundation than this failure to distinguish between the two species, and am satisfied that *Tecoma* is never poisonous in any case.

WILLIAM F. FLINT.

Winchester, N.H., Oct. 24.